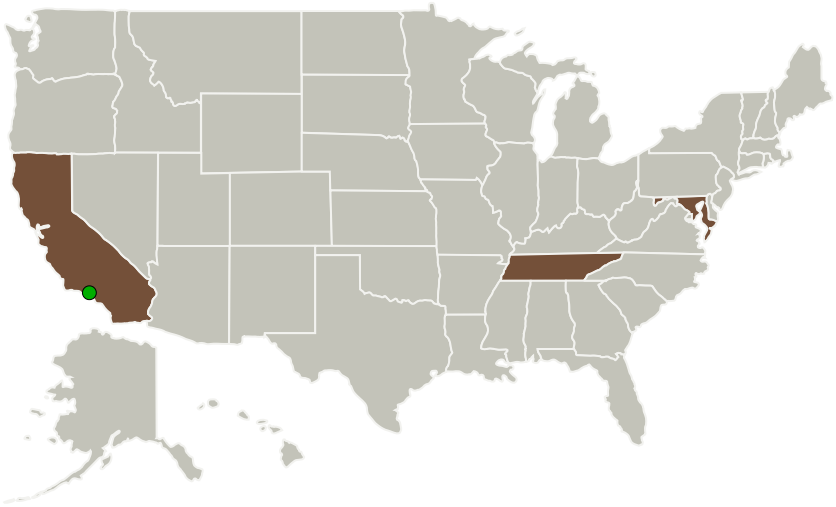
Real-Time Smart Tools for Processing Spectroscopy Data, Phase II

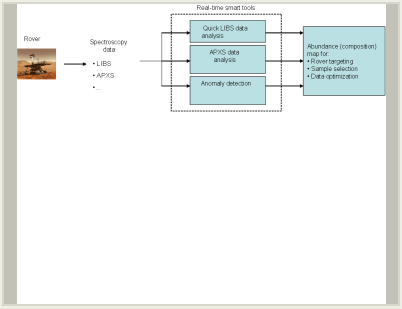
Completed Technology Project (2012 - 2014)

Project Introduction

Since Mars rovers have limited life span, NASA wants to maximize the exploration activities during this period. Rock sample analysis is one of the main tasks of rover missions. Traditionally, rock selection is decided by human operators. Due to long communication delay, manual selection process is time-consuming. There is a strong need to develop an automatic software system to automate the process. We propose a novel and high performance approach to enhancing rock selection process. We explicitly take advantage of the availability of LIBS instrument in the new generation of Mars rover. First, we use LIBS to quickly sample the neighborhood of the rover. LIBS can collect samples in seconds. Our software algorithms can quickly analyze the LIBS data and determine whether there are any interesting chemical elements. If yes, the APXS instrument will be activated. Otherwise, the rover will move to a new location and start the process again. In Phase I, we have demonstrated that our smart processing tools using actual Mars data and our results are more consistent than a current method. Moreover, our tools can implemented in a parallel processing system to achieve real-time performance. Our parallel processing system utilizes multi-core CPUs for distributed processing and we have used such processing architecture for speech and genomic processing.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Signal Processing, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB), Women-Owned Small Business (WOSB)	Rockville, Maryland
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
The University of Tennessee-Knoxville(UT-K)	Supporting Organization	Academia	Knoxville, Tennessee

Primary U.S. Work Locations	
California	Maryland
Tennessee	

Project Transitions

September 2012: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137299)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Signal Processing, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Chiman Kwan

Co-Investigator:

Chiman Kwan

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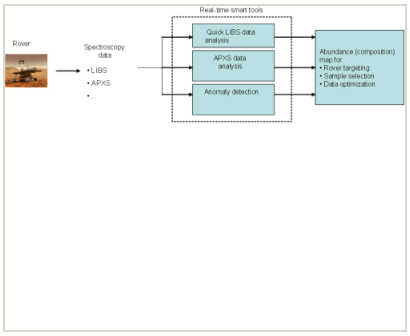
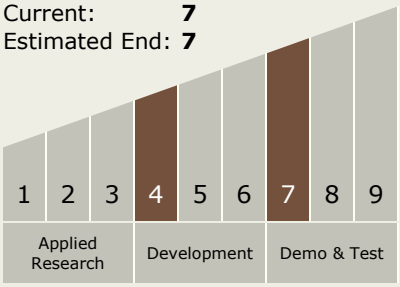
Images



Project Image
Real-Time Smart Tools for Processing Spectroscopy Data
(https://techport.nasa.gov/image/134072)

Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.3 High Performance Processors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System